

IN THE CLAIMS:

1. A single-chip microcomputer comprising:  
a non-volatile memory having a plurality of  
memory block pairs as a combination of a plurality of  
memory blocks each formed of a user region for storing a  
program code by a user and a region for storing a boot  
area designation flag indicating that a boot program to  
be executed first at the time of system booting is  
stored in said user region, in which the boot program is  
stored in a user region of a memory block of a specific  
pair of memory blocks at an initial state where no boot  
region switching processing is conducted,

10  
15 a region switching flag for indicating in which  
memory block pair the boot program is stored in the user  
region among said plurality of pairs of memory blocks,  
and

20  
25 a control element for, when designating other  
pair of memory blocks not designated as a boot region as  
a new boot region, storing a value obtained by  
subtracting a predetermined value from an initial value  
set at said boot area designation flag of the memory  
block of all said memory block pairs in the boot area  
designation flag of each memory block of said other  
memory block pair and at the time of booting the system,  
if the values of the boot area designation flags in the  
memory blocks of said other memory block pair are equal

and not the initial value, determining that the boot program is stored in said other memory block pair to set said region switching flag.

2. The single-chip microcomputer as set forth in claim 1, wherein

said control element,

when the values of the boot area designation

5 flags in the memory blocks of said other memory block pair are different or the initial value, determines that the boot area designation flag in question is invalid to determine that the boot program is stored in the user region of the memory block of said specific memory block  
10 pair.

3. The single-chip microcomputer as set forth in claim 1, wherein

said control element,

when the values of the boot area designation

5 flags in the memory blocks of said other memory block pair are equal and not the initial value,  
if values of the boot area designation flags in the memory blocks of said specific memory block pair are different, determines that the boot area designation  
10 flag in the memory block of said specific memory block pair is invalid to determine that the boot program is stored in said other memory block pair.

4. The single-chip microcomputer as set forth in  
claim 1, wherein

    said control element,

    when the values of the boot area designation  
5 flags in the memory blocks of said other memory block  
pair are equal and not the initial value, if values of  
the boot area designation flags in the memory blocks of  
said specific memory block pair are equal, determines  
that the boot program is stored in a memory block of a  
10 memory block pair which stores a boot area designation  
flag whose value is smaller.

5. The single-chip microcomputer as set forth in  
claim 1, wherein

    said control element,

    when the values of the boot area designation  
5 flags in the memory blocks of said other memory block  
pair are equal and not the initial value or "0",  
determines that the boot program is stored in said other  
memory block pair.

6. The single-chip microcomputer as set forth in  
claim 1, wherein

    at the time of erasure, each memory block of said  
memory block pairs of said non-volatile memory has said  
5 user region and said boot area designation flag erased

simultaneously.

7. A single-chip microcomputer comprising:

a non-volatile memory having a plurality of  
memory block pairs as a combination of a plurality of  
memory blocks each formed of a user region for storing a  
program code by a user and a region for storing a boot  
area designation flag indicating that a boot program to  
be executed first at the time of system booting is  
stored in said user region, in which the boot program is  
stored in a user region of a memory block of a specific  
memory block pair at an initial state where no boot  
region switching processing is conducted,

10 a region switching flag for indicating in which  
memory block pair the boot program is stored in the user  
region among said plurality of pairs of memory blocks,

15 and

a control element for setting said region  
switching flag, wherein

said control element

when designating other memory block pair not

20 designated as a boot region as a new boot region, stores  
a value obtained by subtracting a predetermined value  
from an initial value set at said boot area designation  
flag of the memory block of all said memory block pairs  
in the boot area designation flag of each memory block  
of said other memory block pair and at the time of  
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booting the system, if the values of the boot area designation flags in the memory blocks of said other memory block pair are equal and not the initial value, determines that the boot program is stored in said other  
30 memory block pair,

when the values of the boot area designation flags in the memory blocks of said other memory block pair are different or the initial value, determines that the boot area designation flag in question is invalid to determine that the boot program is stored in the user region of the memory block of said specific memory block pair,  
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when the values of the boot area designation flags in the memory blocks of said other memory block pair are equal and not the initial value, if values of the boot area designation flags in the memory blocks of said specific memory block pair are different, determines that the boot area designation flag in the memory block of said specific memory block pair is invalid to determine that the boot program is stored in  
40 said other memory block pair, and  
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when the values of the boot area designation flags in the memory blocks of said other memory block pair are equal and not the initial value, if the values of the boot area designation flags in the memory blocks of said specific memory block pair are equal, determines that the boot program is stored in a memory block of a  
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memory block pair which stores a boot area designation flag whose value is smaller.

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8. In a single-chip microcomputer including a non-volatile memory having a plurality of memory block pairs as a combination of a plurality of memory blocks each formed of a user region for storing a program code by a user and a region for storing a boot area designation flag indicating that a boot program to be executed first at the time of system booting is stored in said user region, in which the boot program is stored in a user region of a memory block of a specific pair of memory blocks at an initial state where no boot region switching processing is conducted, and a CPU, a boot region designating method of the single-chip microcomputer of, when a user region of a memory block of a specific memory block pair is designated as a boot region in which the boot program is stored, switching a region of other memory block pair as a new boot region, comprising the steps of:

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when designating other memory block pair not designated as a boot region as a new boot region, storing a value obtained by subtracting a predetermined value from an initial value set at said boot area designation flag of the memory block of all said memory block pairs in the boot area designation flag of each memory block of said other memory block pair, and

25                   at the time of booting the system, if the values  
of the boot area designation flags in the memory blocks  
of said other memory block pair are equal and not the  
initial value, determining that the boot program is  
stored in said other memory block pair.

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9.                 The boot region designating method of the single-  
chip microcomputer as set forth in claim 8, comprising  
the step of,

5                   when the values of the boot area designation  
flags in the memory blocks of said other memory block  
pair are different or the initial value, determining  
that the boot area designation flag in question is  
invalid to determine that the boot program is stored in  
the user region of the memory block of said specific  
10                  memory block pair.

10.               The boot region designating method of the single-  
chip microcomputer as set forth in claim 8, comprising  
the step of,

5                   when the values of the boot area designation  
flags in the memory blocks of said other memory block  
pair are equal and not the initial value, if values of  
the boot area designation flags in the memory blocks of  
said specific memory block pair are different,  
determining that the boot area designation flag in the  
10                  memory block of said specific memory block pair is

invalid to determine that the boot program is stored in said other memory block pair.

11. The boot region designating method of the single-chip microcomputer as set forth in claim 8, comprising the step of,

when the values of the boot area designation flags in the memory blocks of said other memory block pair are equal and not the initial value, if values of the boot area designation flags in the memory blocks of said specific memory block pair are equal, determining that the boot program is stored in a memory block of a memory block pair which stores a boot area designation flag whose value is smaller.

12. The boot region designating method of the single-chip microcomputer as set forth in claim 8, comprising the step of,

when the values of the boot area designation flags in the memory blocks of said other memory block pair are equal and not the initial value or "0", determining that the boot program is stored in said other memory block pair.

13. In a single-chip microcomputer including a non-volatile memory having a plurality of memory block pairs as a combination of a plurality of memory blocks each

formed of a user region for storing a program code by a  
5 user and a region for storing a boot area designation  
flag indicating that a boot program to be executed first  
at the time of system booting is stored in said user  
region, in which the boot program is stored in a user  
region of a memory block of a specific pair of memory  
10 blocks at an initial state where no boot region  
switching processing is conducted, and a CPU, a boot  
region designating method of the single-chip  
microcomputer of, when a user region of a memory block  
of a specific memory block pair is designated as a boot  
15 region in which the boot program is stored, switching a  
region of other memory block pair as a new boot region,  
comprising the steps of:

when designating other memory block pair not  
designated as a boot region as a new boot region,  
20 storing a value obtained by subtracting a predetermined  
value from an initial value set at said boot area  
designation flag of the memory block of all said memory  
block pairs in the boot area designation flag of each  
memory block of said other memory block pair,

25 at the time of booting the system, if the values  
of the boot area designation flags in the memory blocks  
of said other memory block pair are equal and not the  
initial value, determining that the boot program is  
stored in said other memory block pair,

30 when the values of the boot area designation

35        flags in the memory blocks of said other memory block pair are different or the initial value, determining that the boot area designation flag in question is invalid to determine that the boot program is stored in the user region of the memory block of said specific memory block pair,

40        when the values of the boot area designation flags in the memory blocks of said other memory block pair are equal and not the initial value, if values of the boot area designation flags in the memory blocks of said specific memory block pair are different, determining that the boot area designation flag in the memory block of said specific memory block pair is invalid to determine that the boot program is stored in 45        said other memory block pair, and

50        when the values of the boot area designation flags in the memory blocks of said other memory block pair are equal and not the initial value, if values of the boot area designation flags in the memory blocks of said specific memory block pair are equal, determining that the boot program is stored in a memory block of a memory block pair which stores a boot area designation flag whose value is smaller.

14.        A boot region switching method of a microcomputer including a non-volatile memory having a first memory block and a second memory block formed of a program

region and a boot area designation flag region, of the  
5 microcomputer, comprising the steps of:

when storing a new boot program in said non-volatile memory instead of said boot program,  
erasing data of said second memory block,  
storing said new boot program in said program  
10 region of said second memory block,  
storing data which are different from data stored in said boot area designation flag region of said first memory block in said boot area designation flag region of said second memory block, and  
15 erasing data of said first memory block.

15. A boot region switching method of a microcomputer as set forth in claim 14, wherein

when reading said boot program,  
reading said boot area designation flag from said  
5 first memory block and said second memory block,  
executing said boot program stored in said first memory block or said new boot program stored in said second memory block based on a comparison result of said boot area designation flag.

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16. A boot region switching method of a microcomputer as set forth in claim 14, wherein

said boot area designation flag region of said second memory block including a first boot area

5 designation flag region and a second boot area  
designation flag region,  
              instead of said step of storing data which are  
different from data stored in said boot area designation  
flag region of said first memory block in said boot area  
10 designation flag region of said second memory block,  
              storing data which are different from data stored  
in said boot area designation flag region of said first  
memory block in said first boot area designation flag  
region of said second memory block,  
15           storing same data as data of said boot area  
designation flag region of said first memory block in  
said second boot area designation flag region of said  
second memory block.